We have defined the excess of water held by tissues under various abnormal circumstances and known under the varying names of excessive turgor, plasmoptysis, edema, etc., as a state of excessive hydration of the tissue colloids, more particularly of the proteins. As the causes of this we have assigned any substance or condition which, under the circumstances surrounding the living cell, is capable of increasing the hydration capacity of its colloids. As the most potent of these causes we have regarded, and still regard, an abnormal production or accumulation of acid in the involved cell. Of other substances conceivably active in certain tissues, which thus increase the hydration capacity of the tissue colloids, we have studied urea. The addition of urea increases in all concentrations the swelling of gelatine and fibrin, and this the more the higher the concentration of the urea. In the higher concentrations of urea both gelatine and fibrin are hydrated so heavily that they go into solution. The urea hydration is not a simple alkali effect, for acid in no concentration counteracts it. The hydrating effects of acid and of urea are additive. There is, however, an interesting difference between the increased hydration brought about by acids and that induced by urea. While salts reduce the former, they do not affect the increased hydration induced through urea. On the other hand, various non-electrolytes which affect the hydration brought about by acids but little, reduce that produced by urea almost entirely.

These facts, taken in conjunction with our previous studies on the colloid-chemistry of absorption and secretion, help toward an interpretation of certain well-known biological and medical facts. They explain on a colloid-chemical basis the behavior of the sugars and certain other organic substances in reducing the absorption of water by tissues. They explain the cathartic action of glycerine, the sugars, etc. They also explain the diuretic action of these substances, accounting for the polyuria of diabetes, the relative dryness of the diabetic's tissues and his thirst. We get an insight into the mechanism of urea hemolysis. Also we learn another method of dehydrating edematous tissues, which owe their excessive hydration to other circumstances than the presence of acid or the absence of salts. In addition to using sugar in order to correct the "acidosis" of certain pathological states from a biochemical point of view, we have made practical use of the above facts by using sugar along with the alkali and hypertonic salt mixtures previously recommended in combating the edemas of the eye (glaucoma), brain (uremia), medulla (pernicious vomiting), kidney (nephritis), and other organs observed in various clinical conditions. The use of dextrose along with salts and alkali in these conditions has yielded even better results than have previously been reported.

A series of papers submitted for publication in the *Kolloid Zeitschrift* will shortly bring the details of these various findings.

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### CHANGES DURING QUIESCENT STAGES IN THE METAMORPHOSIS OF TERMITES

THERE have been several theories as to when the larvæ of termites become differentiated to the various castes in the social organization, the prevalent theory being that undifferentiated larvæ are developed to the castes by the character of the food that they receive. The results of Heath's[1] experiments, however, to determine the relation of various kinds of food to polymorphism were negative. In case of the ants, Wheeler[2] with Emery believes "the adult characters to be represented in the germ as dynamical potencies or tensions rather than morphological or chemical determinants" and that "nourishment, temperature and other environmental factors merely furnish the condi-

[1] Heath, H., "The Habits of California Termites," *Biol. Bull.*, Woods Hole, Vol. IV., December, 1902, pp. 47–63.

[2] Wheeler, W. M., "The Polymorphism of Ants," *Bull. Amer. Mus. Nat. Hist.*, Vol. XXIII., January, 1907, pp. 1–93.

tions for the attainment of characters predetermined by heredity." Bugnion,[3] studying *Eutermes lacustris* and *Termes Redemanni* Wasm. and *Horni* Wasm. states that the differentiation takes place during the embryo stage for the three castes, rather than undifferentiated larvæ being developed to the castes by the character of the food they receive.

Observations by the writer of molting soldier larvæ of *Leucotermes* spp. and *Termopsis angusticollis* Walk. show that the differentiation takes place during a "quiescent"[4] stage rather late in the life cycle. At this point a brief outline of the life cycle is necessary.

In the metamorphosis of the above species the eggs hatch into active, undifferentiated larvæ which develop to the various mature forms or castes by a gradual growth through a series of molts and quiescent stages. During the quiescent stage both the larvæ and nymphs pass through an inactive period, of comparatively short duration, isolated, lying on the side, head bent down to lie on the ventral side of the body along which the antennæ and legs also lie extended in a backward direction. The writer first observed molting larvæ in a quiescent stage on August 11, 1911, in a colony near Jerseyville, Illinois. During April, 1912, the development of nymphs of the first and second forms of *Leucotermes flavipes* Kol. and *virginicus* Banks was observed at Falls Church, Virginia, and it was noted that both these nymphs passed through a quiescent stage in the final molt to the reproductive forms; nymphs of *Termopsis angusticollis* Walk. also pass through this quiescent stage. From the first to the middle of August, 1913, freshly molted, pigmentless soldiers of *flavipes* in the stage preceding maturity were noticeable in colonies in Virginia. On August 17, 1913, molting soldier larvæ were found in the quiescent stage in a colony of *virginicus* at Chain Bridge, Virginia. During the quiescent stage differentiation took place. Larvæ to all external appearances undifferentiated or of the worker type (as shown by the head, the mandibles—with marginal teeth—and the labrum of the still adhering larval skin), the individuals (*virginicus*) being over 3 mm. in length in the quiescent condition, antennæ with 14 segments, develop at this molt to pigmentless nymphs of soldiers with more elongate, soldier-like head and saber-like mandibles, without marginal teeth. In this stage the head, mandibles, labrum and "menton" (Bugnion) have not attained the shape or length of those of the mature soldier, there being at least one later molt to maturity.

Therefore, it may be stated that in case of *Leucotermes* spp. and *Termopsis angusticollis* Walk., the differentiation of the soldier caste occurs during a molt and quiescent stage rather late in the life cycle of the insect, the larvæ being previously, to all external appearances, undifferentiated.

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September 11, 1913

[3] Bugnion, Pr. E., "La différenciation des castes chez les Termites," *Bull. de la Société entomologique de France*, No. 8, April, 1913, pp. 213–18.

[4] Strickland, E. H., "A Quiescent Stage in the Development of *Termes flavipes* Kol.," *Journ. N. Y. Ent. Soc.*, Vol. XIX., No. 4, December, 1911, pp. 256–59.

## THE AMERICAN MATHEMATICAL SOCIETY

THE twentieth summer meeting and seventh colloquium of the American Mathematical Society were held at the University of Wisconsin during the week September 8–13, 1913. The attendance, which exceeded that of any previous summer meeting of the society, included fifty-seven members. The four sessions of the summer meeting proper, for the presentation of papers, occupied the first two days of the week. The first session opened with an address of welcome by Professor C. S. Slichter in behalf of the University of Wisconsin and the local members of the society. The president of the society, Professor E. B. Van Vleck, occupied the chair at this and at the final session. Professor Oskar Bolza presided at the second, and Professor W. F. Osgood at the third session. The council announced the election of the following persons to membership in the society: Mr. W. E. Anderson,